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FACEBOOK, TWITTER, & QR CODES: AN EXPLORATORY TRIAL EXAMINING THE FEASIBILITY OF SOCIAL MEDIA MECHANISMS FOR RECRUITING YOUTH PARTICIPATION TO AN ONLINE SURVEY

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FACEBOOK, TWITTER, & QR CODES: AN EXPLORATORY TRIAL EXAMINING
THE FEASIBILITY OF SOCIAL MEDIA MECHANISMS FOR RECRUITING
YOUTH PARTICIPATION TO AN ONLINE SURVEY

BY
LUCY L. GU

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
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MASTER OF ARTS THESIS

OF

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ABSTRACT

This study examined the effectiveness of three social media based recruitment channels for sampling rural adolescent populations for online health research. At present, there is no consensus on the optimal social media based vehicle for recruiting adolescents due to limited research. This exploratory study compared Facebook ads, Twitter, and QR code postcards at three different but demographically similar rural high schools. The results showed that QR code postcards had the highest response percentage and the lowest cost per recruited participant, whereas Twitter had the lowest response percentage and Facebook had the highest cost per recruited participant. Although this is the first time QR codes were examined in this context, it seemed to show potential in online health research. The findings are interpreted from a variety of theoretical and conceptual frameworks. Applications of each recruitment channel are discussed and suggestions are provided for future research.

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TABLE OF CONTENTS

ABSTRACT	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	v
LIST OF FIGURES	vi
INTRODUCTION	1
METHODOLOGY	10
RESULTS	17
DISCUSSION	21
BIBLIOGRAPHY	35

LIST OF TABLES

TABLE	PAGE
Table 1. Frequencies and percentages of demographic characteristics by recruitment channels _____	18
Table 2. Frequencies and percentages of responses by recruitment channels ____	20

LIST OF FIGURES

FIGURE	PAGE
Figure 1. Examples of QR Code postcard used, front and back _____	14
Figure 2. Example of Facebook ads used _____	15
Figure 3. Example of tweets by the “student core group” _____	16

INTRODUCTION

Adolescents, defined as 11 to 21 years of age (Bright Futures, 2012), are proportionally one of the largest age groups accessing the Internet multiple times a day (Pew Research Center, 2011). Following the Internet's widespread prevalence in the 1990's, social networking sites flourished in popularity. The youth population is among its heaviest users (Zamaria & Fletcher, 2007). A report by the Pew Research Internet Project reported that 95% of teenagers in the United States have access to the Internet (Pew Research Center, 2014), while the majority of this population uses the Internet on a daily basis. Moreover, the same research revealed that 74% of this age group are “mobile internet users”, who report having access to the internet on smartdevices such as cellular phones, tablets, and other mobile technologies. Overall, adolescent use of social media as well as the amount of information they are willing to share about themselves has been steadily increasing, particularly in the past 5 years (Pew Research Data, 2014).

Although adolescent use of social media is on the rise, its efficacy in research recruitment remains unclear. Recruitment of high school aged youths poses several unique challenges. Challenges in recruiting research participants can interfere with the research process, thus placing additional strain on researchers to complete studies within the intended time and budget limits (Hulley & Cimmings, 2001). The two principal goals of recruitment are to obtain a sample that is representative of the target population, and to recruit a sufficient number of participants with adequate power to test the study's hypothesis (Hulley & Cimmings, 2001). In recruitment of high school participants, researchers must first gain access to multiple levels of school administration, teachers,

and students. Once entry is acquired, researchers face barriers such as classroom schedules, exams, extracurricular activities and absences that ultimately limit recruitment activities (Lamb, Puskar, & Tusaie-Mumford, 2001). As such, classroom and school activities are inevitably disrupted throughout the data collection process and result in increased response burden for schools. Thus, alternative channels of recruitment may be more practical in accessing high school youths than traditional paper and pencil methods, especially given this population's embrace of technology use.

Prior research has suggested the need for recruitment strategies alternative to conventionally used methods (e.g., paper and pencil), specifically social media and smartphone strategies (Lohse et al., 2013). Social media is described as a "group of internet-based applications that build on the ideological and technical foundations of Web 2.0 and that allow the creation and exchange of user generated content" (Kaplan & Haenlein, 2010). Social media channels present a plausible line of recruitment tools that has recently demonstrated success in reaching a variety of populations and settings (Bedrick & Sittig, 2008; Lewis, Kaufman, Gonzalez, Wimmer, & Christakis, 2008; Schleyer et al., 2008), which has included accessing geographically isolated rural populations; recruitment of adolescent females to follow-up studies; targeting young adults regarding health risk behaviors; and offering an alternative avenue to bypass some of the barriers that traditional recruitment channels pose (Jones et al., 2012; Lohse, 2013; Lohse & Wamboldt 2013; Ramo & Prochaska 2012).

The current literature on using social media channels to recruit participants is expanding (Gold et al., 2011; Lau et al., 2011). However, few studies have used such channels in sampling specifically adolescent populations with documented success (Jones

et al., 2012; Lord, Brevard, Simon, 2011; Ramo, Hall, & Prochaska, 2010; Ramo & Prochaska, 2012). Thus, there is a meaningful gap in the literature for guiding recruitment of rural high school aged students to an online survey by way of social media. This study explores the potential of using three social media channels to recruit students from three rural public high schools to an online survey regarding previously implemented social norms campaigns.

Social norms campaigns are executed in order to correct existing misperceptions about social norms, or expected standards regarding some type of problem or risk behavior. Social norms campaigns are usually implemented within school communities to educate and inform students, and have shown success in reducing risk behaviors such as alcohol and tobacco use in adolescents (Berkowitz, 2005; Burchell, Rettie, Patel, 2013; Moreira, Smith, Foxcroft, 2009). Berkowitz (2005) theorized that an overestimation of the prevalence of problem or risk behaviors is associated with an increased participation in such behaviors. The primary objective of such a campaign is to penetrate the behavioral and social expectations of the targeted population, thereby reducing personal and community risk in that respective population (Berkowitz, 2004; Perkins et al., 2010).

Given the adolescent population's embrace of the Internet, exploration of social media channels may be a practical approach to recruiting adolescents to online surveys which ask about exposure to social norms campaigns. Presently, Facebook is the most popular social networking forum in the world and the second most popular website in the United States, with only Google topping the list with more daily visits (Alexa, 2014). As of 2013, Facebook has an estimated 1.23 billion active users worldwide. Of that, an average of 945 million users actively access the social networking website with their

mobile devices on any given day (Facebook, 2014). Online networking communities, such as Facebook, allow individuals to create and manage personal profiles while maintaining online connections with their social networks (Ellison, Steinfield, & Lampe, 2007). Moreover, recent Pew research data compiled from a nationally representative sample of Americans ages 12-17 revealed that 77% of this population have active Facebook accounts, and 98% of these Facebook users are connected with people they know from their high schools (Madden et al., 2013). The same research found that 89% of adolescents are also networking with friends who do not attend the same school. Adolescents are not only using Facebook for connecting with their friend networks, but also for discovering and digesting health-related news (Baptist et al., 2011; Hedge & Donald, 2011). The way that adolescents are communicating is changing, and so are the reasons for which this population is using social networking sites such as Facebook. Accordingly, it is useful to examine the feasibility of using Facebook for recruiting adolescents.

This social networking site's ability to reach populations across geological locations and user demographics is at the heart of its recruitment appeal (Burbary, 2011). Researchers who wish to purchase advertising space on Facebook may choose to display their study by marketing to a particular target audience who meet the inclusion criteria. In recent years, the effectiveness of using Facebook and other social media sites for participant recruitment has attracted a steady growth of academic inquiry across various domains; including mental health, health behavior, substance use, tobacco use, nutrition, medical research, and other health-related topics (Batterham, 2014; Fenner et al., 2012; Lohse 2013, Lohse & Wamboldt, 2013; Ramo, Hall, & Prochaska, 2010; Ramo &

Prochaska, 2012). Recruitment of hard-to-reach populations with potentially sensitive and stigmatizing matters, such as HIV/AIDS or substance use and abuse (Ramo & Prochaska, 2012; Wagenaar, Sullivan, & Stephenson, 2012), have benefitted from Facebook's privacy of participation. A previous literature review highlighted Facebook's primary benefits as its ease of use and cost effectiveness in research recruitment (Park & Calamaro, 2013). Moreover, Fenner et al. (2012) found that by targeting specific demographic and geographic populations (urban vs. rural), online social networking sites may be fruitful in reaching a favorable sample size as well as a diverse sample of young adult participants. While there has been a steady growth of interest in Facebook's potential for research recruitment, several review articles (Gold et al., 2011; Lau et al., 2011; Pujazon-Zazik & Park, 2010) investigating the use of social networking sites suggested that while popular sites like Facebook show promise, further research is essential in clarifying its recruitment capability of producing fruitful outcomes.

While Facebook is currently the most popular social networking site globally, Twitter is the most popular microblogging platform, with nearly 650 million registered users as of 2014, and growing (Statistics Brain, 2014). Within the United States, Twitter has an estimated 140 million active users, generating on average 340 million tweets per day (Rao, 2012). Teenagers are migrating to Twitter in growing numbers, often times as a supplement to their other social media accounts such as Facebook (Madden et al., 2013). Twitter stands out from other social media platforms because of its capability to map social communities of ideas generated on its microblogging platform. It relies on a respondent driven model of speedily dispersing information across an extended network of users. Unlike other forms of social media, Twitter limits its messages, or "tweets", to

140 characters (Jansen et al., 2009), which bestows brevity and immediacy of message communication. Given the teenage population's escalating adoption of digital technologies, Twitter has generated burgeoning interest in the research community for its potential as a tool for tracking and gathering public opinions and social movements (Tumasjan, Sprenger, Sandner, & Welp, 2010). Particularly, it has proven to play a crucial role in political events and journalism. Many journalists and other professionals themselves have turned to Twitter to access up-to-the-minute news and information (Lupton, 2013). Researchers have referred to it as an "information company" (Jansen, Zhang, Sobel, & Chowdury, 2009) and an essential form of electronic word-of-mouth (e-WOM) tool, which is inherently the transmission of information from one person to another. It has received growing attention for its untapped potential by the social commerce industry (Jansen et al., 2009; Zhao & Rosson, 2009; Giles, 2010), but its use as a subject recruitment vehicle is less well-known.

Insight into whether Twitter can be used as a channel for research recruitment instead of its more traditional medium for informational posts may be valuable to the research community. An established communication theory on the follow of social influence, known as the Two-Step Flow of Communication or Multilevel Flow Model, lends to understanding Twitter's reach capability. This model posits that a small group of users called opinion leaders can be preeminent in disseminating mass media information to a broad network of individuals within their communities (Katz, 1957; Katz & Lazarsfeld, 1955; Stanley, 2011). Opinion leaders essentially serve as catalysts for the diffusion of ideas or products. Thus, a wide range of the target networks can be reached at relatively low costs if information can flow from the mass media channel to opinion

leaders, ultimately trickling down to a wider target audience (Weimann, 1991). It is appealing for researchers to capitalize on Twitter's reach potential, following the expansion of the Internet and social media (Bulearca & Bulearca, 2010). Even as such, there is limited literature on using Twitter as a mechanism for online health research, let alone examining its recruitment feasibility versus other social media channels (Lupton, 2013; Shi, Rui, & Whinston, 2014). At the time of this writing, two known prior studies were found to have examined Twitter as a method of recruiting adults for online research. Quach and her colleagues (2013) examined Twitter for recruiting adult parent participants to an online survey regarding flu vaccines, compared with other online recruitment channels. Twitter was the least effective recruitment strategy in this study, citing an insufficient network of followers as the main problem. Another study, on the contrary, that was relatively effective in recruiting mothers of advanced maternal age through Twitter benefitted from an abundant network of followers (O'Connor, 2013). Presently, there is a scarcity of research using Twitter to recruit adolescents to online health research.

A third social media method that is not yet well studied for youth recruitment is QR codes. QR codes are two-dimensional matrix barcodes designed to be scanned and decrypted by smartdevices (i.e., smartphones, tablets) at a high speed (Mobile Barcodes, 2008). Each code is made up of black units of differing sizes, which are then assembled into a square block superimposed on a white background. QR codes allow for users to be directly linked via the Internet to predetermined web addresses encoded within the QR codes. These codes enable smartdevice users to be instantaneously transported to a URL, text, or other data. QR codes were originally created in 1994 by the Toyota subsidiary

company Denso Wave for tracking and swift decryption of automobile components (Jupiter, 2011).

QR codes are what mobile researchers refer to as a “pull strategy”, which is a marketing technique that exposes messages to users through means outside of the mobile device that calls for users to respond (Dou & Li, 2008). These 2-D barcodes have also been effective in drawing contestants to television program contests (Li & Lee, 2006), as well as marketing library services (Pulliam & Landry, 2011). At the time of this writing, research on QR codes has predominantly investigated its capability as a consumer-marketing tool. The potential value of the QR Codes lies within its ability to expeditiously connect smartdevice users with a predestinated webpage by scanning the barcode. However, its use in health research recruitment is presently unknown.

In terms of studies that have compared different online and social media channels for subject recruitment; to date, there are only a handful studies. One such study compared the effectiveness of three internet-based recruitment channels including, Craigslist ads, Internet ads, and e-mailing, for online surveying of young adult smokers (Ramo, Hall, & Prochaska, 2010). The recruitment campaign ran for 6 consecutive months while participants were invited to partake in a 20-minute online survey about their smoking behaviors. Participants were entered into a random drawing for the chance to win a prize. This study found Craigslist ads to be the most cost-effective and successful tested method in reaching the study’s target population. Another comparative study examining differing recruitment channels used social media (Facebook and Twitter), deal forum websites (RedFlagDeals, SmartCanucks), online classified ads (Craigslist and Kijiji), conventional mass media, and email lists to register parents of

school-aged children for an online survey (Quach et al., 2013). This study found the most recruitment success through deal forum websites and the least recruitment success via Twitter. Another study examined notice boards, web and social networking sites (Facebook and Twitter) for recruiting and retaining young women ages 18-25 to three nutritional studies (Leonard, Hutchesson, Patterson, Chalmers, & Collins, 2014). Leonard and her colleagues concluded that social media was comparatively the most effective recruitment avenue; while e-mail, phone, and text message communication enhanced retention rates. However, the authors emphasized caution in directly comparing the recruitment vehicles, as there were disparities in the degree of participant burden as well as differences in incentives used across study groups. Although a few studies using social media for sampling subjects have been conducted, there is no clear pattern on how to best use these technologies in online research recruitment.

This study's primary objective is to compare the recruitment potential of three social media channels under similar conditions (e.g., similar school systems demographics and identical incentive). Adamson et al. (2007) investigated strategies for reaching women from the Australian Longitudinal Study on Womens Health (ALSWH) and stated the importance of piloting on recruitment channels that are practical for the target population and documenting productive strategies. Presently, there is still a lack of research delineating the feasibility of using social media channels to recruit adolescent participants to online health research, and none to date which compare different types of channels such as social networking sites (Facebook), microblogging platforms (Twitter), or marketing based scan codes (QR codes). Results from this study may provide

researchers with information about the effectiveness of their various choices in using social media channels and strategies to reach school-age youth populations.

Research Question

This is an exploratory study regarding the feasibility of three social media channels in recruiting youths to an online survey. Thus, the principle question is which distinct recruitment channel would result in the highest response rate and lowest cost-per-recruited-sample in recruiting a rural adolescent population.

METHODOLOGY

Settings

The data was obtained by exploring three Rhode Island public high schools serving rural communities with similar population and economic indicators. Rural communities have been defined as encompassing populations and territories not considered urban (U.S. Department of Health and Human Services, 2014). Populations of the high schools whose students were being recruited to participate in our online survey were also similar. Finally, the social norms campaigns, although similar in intent - to correct student misperceptions of peers use of marijuana - and delivery channels had different logos and "tag lines".

Chariho High School (CHS) serves the towns of Charlestown, Richmond and Hopkinton within Washington County. The total population served by the school is around 23,700 people and the median household income is approximately \$51,000, as

males had a median income of around \$40,000 versus \$29,000 for females. The cities' per capita income is approximately \$23,000. Approximately 4.0% of the overall county population is below the poverty line. The total CHS student population was 1,100 (49% females, 47% males; 94% Caucasian, 7% Native American or Alaskan Native, 6% Black, 5% Asian, and 3% Native Hawaiian or other Pacific Islander). The social norms campaign implemented at CHS was titled "Fit IN", which seeks to highlight the student body's overestimations of marijuana use in the hopes of strategically reducing marijuana-related behaviors and enhancing latent healthy norms. "Fit IN" is both the campaign's logo and slogan, delivered through multiple channels.

Tiverton High School (THS) serves the town of Tiverton in Newport County. Total population served by the school is around 15,800 people. The median household income is approximately \$50,000, while males had a median income of around \$41,000 versus \$29,000 for females. Tiverton's per capita income is approximately \$23,000. Approximately 4.5% of the town's overall population is below the poverty line. The total THS student population was 550 (49% females, 47% males; 93% Caucasian, 5% Native American or Alaskan Native, 4% Black, 5% Asian, and 2% Native Hawaiian or other Pacific Islander). The social norms campaign implemented at THS is titled "UnMarketing Weed" with the logo "5⇓6", which symbolizes correction of the false perception that marijuana is safe, currently believed by 56% of the student body. Delivery channels include face-to-face presentations by youth, e-newsletters and posters.

Ponaganset High School (PHS) serves the towns of Foster-Glocester within Providence County. Total population served by the school is around 14,352 people. The median household income is approximately \$58,000, while males had a median income

of around \$39,000 versus \$30,000 for females. The cities' per capita income is approximately \$22,000. Approximately 4% of the town's overall population is below the poverty line. the total PHS student population was 589 (48% females, 48% males; 94% Caucasian, 4% Native American or Alaskan Native, 4% Black, 3% Asian, and 2% Native Hawaiian or other Pacific Islander. The social norms campaign implemented at PHS is titled "Join the Majority", aimed at reducing personal and community risks by correcting existing misperceptions relating to marijuana norms within the high school. The campaign has its own logo and slogan "7 out of 10 students at PHS don't use Marijuana. Join the majority". The campaign uses multiple channels to deliver its message (e.g., posters, newsletter articles, ads in local newspapers, student projects, tee-shirts and other promotional items).

Measures

This study was interested in recruiting high school participants using three different social media channels, each of which was implemented in a separate high school. A survey was created which contained 53 items that were personalized to the respective school's social norms campaign. Measures embedded in the surveys included: unaided and aided awareness of campaign recognition, modes of exposure, frequency of exposure, key message recognition, and outcome measures. Demographic information gathered included: grade level, gender, race/ethnicity, and socioeconomic status denoted by combined parental education levels. The online survey was administered via Survey Monkey, and was pretested for usability and technical functionality. Each survey took approximately 8 to 10 minutes to complete during pretest. The primary measure of

interest for this study was if a student accessed an online survey. All students participating in the online survey were considered respondents as the degree to which the instrument was completed was not of interest for this study. The actual responses to the survey will be used for a separate study as this study focused on recruitment rate.

Procedures

Three different strategies were employed in attempts to recruit high school students to an online survey: QR code postcards, Facebook ads, and Twitter messages. A different recruitment channel was assigned randomly to each of the three high schools. Students at THS received postcards with embedded QR codes and information relating to the contest rules. Postcards were created and purchased through Vistaprint (Figure 1), an online promotional company that specializes in print-on-demand services. Total costs for purchasing the postcards were \$137. Postcards were distributed throughout the high school to homerooms in all grade levels by a school liaison. This liaison served as the study facilitator at the high school. The purpose of the placement was so the school liaison could answer questions in regards to accessing the survey, and to conduct the groundwork necessary for the postcards successful integration into the homerooms. With one scan of the QR code with their smartdevices, students were automatically relayed to their school's online survey. Boosters were implemented, which included weekly reminder announcements and posted postcards on the school bulletin board.

Figure 1. Example of QR Code postcard used, front and back



Facebook ads were used to recruit PHS students by targeting user profiles that fit the study's inclusion criteria. The Facebook ads were titled "Ponagansett HS Survey" and were comprised of an image of the school's logo and main text up to 130 characters in length (Figure 2). By taking advantage of Facebook's ability to aim ads to specific demographic groups, users aged 14-19, with "high school" as the indicated current level of education, and who resided within a 10-mile radius of the Foster community were targeted. As outlined on Facebook's business page, "impressions" are defined as the number of times the ads are shown within the target population, "reach" is the number of people who sees the ad, and "clicks" denote the number of times the ad was clicked on. Facebook calculates the average "cost per click" as the total amount spent divided by the total number of clicks received. The Facebook ad was served to each person an average of 135.65 times resulting in 254 total website ad clicks. A total of \$439 was spent for advertising. The total population reached by the end of contest date was 2983 individuals. When a Facebook user clicked on an ad, he or she was directed to our secure online survey. This study chose the cost-per-click advertising option, as the study was particularly interested in examining the total number of clicks to the survey site by the target population. There was an option of having a Facebook page linked within the ads,

in order to have a broader appeal by appearing both within the newsfeed and on the right-hand side of the webpage. Each time the Facebook ad was clicked on, the study was charged \$1.73.

Figure 2. Example of Facebook ads used



CHS students were recruited using Twitter. A group of 15 CHS students were identified by the school counselor as the initial tweeters of the contest message (Figure 3), which this study deemed as the “core group”. The core group consisted of 10 (66.67%) females and 5 (33.33%) males; 2 (20%) freshmen, 4 (33%) sophomores, 7 (47%) juniors, and 2 (20%) seniors, and most of who belonged to after school clubs or sports teams. Such students were selected in line with previous communication research (Park, 2013), which postulates that a select group of “opinion leaders” that are considered leaders, or trendsetters, within their communities, can be effective as the impetus for idea transmission to others within the community. Of the original 15 interested core group students, 10 participated in the initial round of tweeting to their network of Twitter friends. A uniform tweet was created in conjunction with the core group members prior to the commencement of the contest. This was to encourage student involvement and

facilitate senses of personal investment. Reminder emails were sent to the core group members one week prior to the contest beginning, then again the evening prior to the first day of the contest. Subsequently, reminder emails were emailed to the core group every Monday of the recruitment period as boosters. An auxiliary level of incentive was implemented so that each initial tweeter within the core group would receive a \$10 iTunes gift card. This individual incentive was to encourage tweeting the initial contest message and tweeters were asked to reply to the reminder emails each time they tweeted our message; thus the cost spent on the tweeters was \$100.

Figure 3: Example of tweets by the “student core group”

"Are you a Chariho HS Student? Win an iPad Air! Fill out survey 5/5 - 5/26. WINNER ANNOUNCED 6/2! #CHSWinIPAD www.surveymonkey.com/s/CharihoInterceptSurvey"

Online surveys were open for participation across a three-week period from May 5 to May 26, 2014. To improve participation, the study included raffle drawings for one participant from each school to win an iPad Air, each valued at \$500. Raffle drawings for the prizes were utilized instead of individual incentives, as previous research supported the notion that younger adults prefer drawings to individual types of incentives (Ramo, Hall, Prochaska, 2010). Participants were only eligible to enter the drawing upon completing the online surveys, and were instructed upon arriving at the survey that they would be redirected to a separate page in order to provide contact information once they completed the survey. This secondary page was established to ensure confidentiality of survey responses. Participation was voluntary and only students who completed the surveys received entry into a random drawing within their respective school for a chance

to win the prize. All students participating in the online survey, regardless of completion, were considered respondents. In an effort to preserve data fidelity by preventing duplicate survey attempts, student names retrieved from the de-identifying page and were cross-referenced with enrollment roles from the respective high schools in order to avoid bogus entries. Only initial surveys of duplicate entries were included in the study.

RESULTS

Participant Characteristics

Demographic data was gathered from all 155 respondents; covering grade level, gender, race/ethnicity, and parental education levels of both mother and father and is presented in Table 1. Descriptive statistics of respondent across the three recruitment channels revealed similar demographic trends in the QR code and Facebook recruitment schools, whereas Twitter emerged with a different pattern, which may be due to the small sample size.

Respondents' grade level profiles revealed a reasonable representation of students across grades 9-12 as the average percentages of all respondents recruited in this study were: 24% freshmen, 22% sophomore, 28% juniors, and 26% seniors. In terms of gender, the QR codes recruitment sample had a somewhat balanced proportion of gender, the Facebook recruitment sample contained a higher percentage of male respondents, and the Twitter recruitment sample contained a higher percentage of female respondents. Although gender distribution varied across recruitment channels to some degree, the average sample were distributed somewhat evenly with 56% female and 44% male respondents. Distributions of the race/ethnicity affiliations across recruitment channels

were roughly representative of the overall school populations. Caucasians were overrepresented in the sample, with over 80% identifying as such. It is important to note that participants in this study were able to identify with multiple race/ethnicity categories, hence the creation of a multi-racial/ethnic subcategory. This study also asked for the highest attained education levels of participants' mother and father. Participants classified each parents as one of the following: Less than high school degree, High school degree or equivalent (e.g., GED), Some college but no degree, Associate Degree, Bachelor Degree, Graduate Degree, Not sure. Children of higher-educated parents were somewhat over-represented in this sample. For example, 50% of the total respondent sample indicated having parents who received at least some level of formal education post high school.

Table 1 Frequencies and percentages of demographic characteristics by recruitment channels

Characteristics	QR Code	Facebook	Twitter	Total
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
Gender				
Female	44 (45.36%)	19 (61.29%)	21 (77.78%)	84 (54.19%)
Male	53 (54.64%)	12 (38.71%)	6 (22.22%)	71 (45.81%)
Total <i>n</i>	97	31	27	155
Race/Ethnicity^a				
American Indian	0	1 (3.23%)	0	1 (0.65%)
Asian / Pacific Islander	3 (3.09%)	1 (3.23%)	0	4 (2.58%)
Black	0	0	0	0
Hispanic American	5 (5.15%)	1 (3.23%)	1 (3.70%)	7 (4.52%)
White	83 (92%)	28 (90.32%)	23 (85.19%)	134 (86.45%)
Multi-Racial/Ethnic	6 (6.19%)	0	3 (14.81%)	9 (5.81%)

Total <i>n</i>	97	31	27	155
Highest Parental Education^b				
Less than HS degree	8 (8.25%)	2 (6.45%)	0 (0%)	10 (6.45%)
HS degree or equivalent (e.g., GED)	21 (21.65%)	5 (16.13%)	7 (25.93%)	33 (21.29%)
Some college but no degree	10 (10.31%)	6 (19.35%)	3 (11.11%)	19 (12.26%)
Associate Degree	7 (7.22%)	7 (22.58%)	5 (18.52%)	19 (12.26%)
Bachelor Degree	13 (13.40%)	6 (19.35%)	6 (22.22%)	25 (16.13%)
Graduate Degree	13 (13.40%)	2 (6.45%)	4 (14.81%)	19 (12.26%)
Not sure	25 (25.77%)	3 (9.68%)	2 (7.41%)	30 (21.29%)
Total <i>n</i>	97	31	27	155
Grade Level				
9	28 (28.87%)	9 (29.03%)	2 (7.41%)	39 (25.16%)
10	24 (24.74%)	6 (19.35%)	4 (14.81%)	34 (21.94%)
11	18 (18.56%)	6 (19.35%)	15 (55.56%)	39 (25.16%)
12	27 (27.84%)	10 (32.26%)	6 (22.22%)	43 (27.74%)
Total <i>n</i>	97	31	27	155

^a Respondents were not limited to the number of race/ethnicities they could identify with, thus those indicating more than one response were considered *multi-racial/ethnic*.

^b Based on an average of mother and father highest parental education levels.

Recruitment Response Rates

During the 3-week recruitment period, a total of 155 students responded. The percentages of responses varied across recruitment channels (Table 2), from nearly 18% to just over 2%. QR codes emerged as the most useful recruitment channel, followed by

Facebook, then Twitter which generated the lowest participation rate. A chi-square test was conducted to determine whether there were significant differences in response rates across recruitment channels. Examination of initial results $\chi^2(2) = 110.71, p < .001$, indicated the presence of a relationship between social media recruitment channels (QR codes, Facebook, Twitter) and survey responses (responded, did not respond). In order to examine differences between dyads, a Bonferroni correction was used; for an overall $\alpha = .05$, p -values for each pairwise comparison must be less than $0.05/3 = .017$ to be significant. Using the Bonferroni adjustment, it was discovered that QR codes had a significantly higher response rate than Facebook ads, $\chi^2(1) = 34.81, p < .001$, as well as Twitter $\chi^2(1) = 100.32, p < .001$. Furthermore, Facebook revealed a higher response rate than Twitter, $\chi^2(1) = 8.45, p < .01$. These findings provide evidence that response rates significantly differed across social media recruitment channels.

Table 2. Frequencies and percentages of responses by recruitment channels

Recruitment Method	Responses <i>n</i>	Total school enrollment	School response percentage (%)
QR Code	97	550	17.64%
Facebook	31	589	5.26%
Twitter	27	1,100	2.45%
Total	155	2,239	6.92%

Cost Per Subject

Cost per subject is a variable that is also relevant when examining recruitment strategies (Ramo, Hall, & Prochaska, 2010). For each recruitment channel, the total drawing incentive cost for an iPad Air was \$500. Additionally, variations of secondary

recruitment costs varied by each school and recruitment strategy. The differences in recruitment channel response rates demonstrate differentiations in average recruitment costs per subject. QR code postcards was the most cost-effective recruitment channel, acquiring a total recruitment cost of \$637 (\$137 in postcards; \$500 in iPad). Average cost per QR code recruited participant was \$6.57. Facebook recruitment cost a total of \$939 (\$439 for ads; \$500 for iPad), with an average cost per Facebook participant of \$30.29. Twitter recruitment cost a total of \$600 (\$100 for auxiliary incentives; \$500 for iPad), with an average cost per Twitter participant of \$22.20.

DISCUSSION

This study examined the differences in recruitment effectiveness and cost-per-recruited-sample of three social media recruitment channels. QR code postcards were the most successful and cost-effective campaign in targeting high school adolescents to participate in an online survey. Facebook ads were not as effective as previous literature had indicated in recruiting an adolescent sample. A Twitter campaign in recruiting adolescent populations to an online survey was the least successful. Nevertheless, potential explanations for recruitment effectiveness for each approach are considered and may be beneficial for understanding the current findings and guiding future studies.

QR Code Postcards Campaign

The current study found QR code postcards to be the most effective method of the three tested, defined as having the highest response rate and lowest cost-per-recruited-sample in recruiting youth participants to an online survey regarding their school's social norms campaign. QR codes generated a 17.64% response percentage, which translated to

an average cost of \$6.57 per recruited subject. Prior research by Shin (2012) hypothesized that QR code users behaviors are rooted in an adaptation of two established theories: Theory of Planned Behavior (TPB; Ajzen, 1991) and Technology Acceptance Model (TAM; Davis, 1989). TPB is a predictive model for human behavior that postulates human behavior as rational and comprised of systematically decisions made based upon available information (Ajzen, 1991). It was determined that intention is one of the principal causal influences on behavior (Webb & Sheeran, 2006), and is influenced by attitude, subjective norm, and perceived behavioral control (PBC). Attitude is the individual's assessment of whether performing the behavior is positive or negative and subjective norm is the perceived social pressure to perform or not to perform the behavior. PBC is the perceived ease or difficulty of performing the behavior. On the other hand, TAM proposes that when individuals are presented with new technology, usage is influenced by perceived usefulness and perceived ease-of-use. Fred Davis, who first proposed this now leading model in predicting systems use, hypothesized that an individual's response to technology use is a reaction that can be studied and anticipated by the user's motivation, which is influenced by the technology system's features and capabilities. That is, the model theorized that an individual's attitude toward a technology system was the key determinant in whether the user will use or refuse the system.

It may be the case that students actively evaluate the information at hand using a hybrid of the aforementioned theories in order to decide on whether or not to use the QR codes. More specifically, it may be the case that the tangible nature of the QR code postcards offered a sense of permanency in that students can refer back to the postcards at their discretion. Guidance from the school liaison in logistics support may have

contributed to the channel's user-friendliness and overall approachability and therefore buttressed the recruitment process. On the other hand, the QR code's rapid transference to its linked online survey may have supplemented this channel's perceived ease-of-use, thereby generating positive student attitudes toward the technology and motivating adoption of the system. Prior TAM research has suggested that perceived ease-of-use has a direct influence on perceived usefulness (Chutter, 2009). Accordingly, by minimizing the participants' perceived difficulty of connecting to the online survey, students may be more apt to embrace the technology given that it may boost their abilities to access the study survey. The QR code campaign's success may have been predicated upon the approachability of the method, supplemented by additional yet minimal involvement of the school personnel. Given that these postcards were distributed throughout the school's homerooms, the widespread presence of the postcards within the school may have contributed to the perceived social pressure to perform the behavior, or the subjective norm, of accessing the QR codes.

Additionally, an extended model of TPB includes additional variables such as belongingness and self-identity in predicting social media use intention in sample of young people ages 17-24 (Pelling & White, 2009). Perhaps a sense of cohesion is offered by implementing a recruitment channel to adolescents within a school setting, supplemented by using the school colors and logo on the QR code postcards, thereby contributing to student QR code users' senses belongingness. As for identity, TPB research has shown that self-identity predicts increased levels of social networking medium use (Pelling & White, 2009). This suggests that social media use is in fact part of

one's identity. Thus, an increased sense of belongingness and self-identity may also be positively related with intent to use QR codes.

Facebook Ads Campaign

Facebook's pervasiveness in current youth culture and wide reach potential make it a preferential medium for targeting adolescent populations. Even so, the sample recruited through this study's Facebook campaign was not as successful as expected. Facebook ads reached approximately 5.26% of the total PHS recruitment sample, resulting in costs of \$30.29 per recruited sample. This was in line to slightly higher than costs of previous population-based studies that used comparable recruitment mechanisms (Jones et al., 2012; Lohse, 2012; Lohse & Wamboldt, 2013; Lord et al., 2011; Ramo, Hall, & Prochaska, 2010; Ramo & Prochaska, 2012). It is important to note that Facebook was the least invasive recruitment method, as this study relied exclusively on ads for recruiting PHS students. There are some conceptual frameworks that may help untangle the implications behind these findings.

The Facebook ads used in this study were personalized to target the high school population by featuring the school logo and promotion of the iPad incentive (Figure 1). Previous research has consistently documented that tailored advertising content is more effective at reaching target audiences than standard, non-personalized ads (Li & Kalyanaraman, 2013; Kim & Sundar, 2012; Kalyanaraman & Sundar, 2006; Sela, Lavie, Inbar, Oppenheim, & Meyer, 2014). Specifically, prior literature examining participant recruitment using Facebook ads found ad content to be a crucial and key component to successful recruitment (Batterham, 2004). Particularly, Batterham (2004) found that online ads using "problem" language, such as the phrase *mental health problems*, were

more effective than using “positive” language, such as the phrase *emotional well-being*. In other words, a sense of necessity or urgency attached to advertising semantics played a role in whether people click on ads. As such, ads that are presented as the most aligned with survey content without softening the topic at hand were the most successful in recruiting participants. In light of these findings, the Facebook ads used in this campaign may have lacked in sufficient “problem” terminologies, which in turn translated to less favorable method response rates.

Although advertising content may have been related to the Facebook ad campaign’s response rate, a more technology-based element may have contributed to the Facebook campaign’s efficacy. In recent years, Facebook has evolved beyond an accumulation of online profiles, into a hub of knowledge sharing. It has become a utility that encourages communication and sharing within friend networks that could be extended to letting peers know about an online survey with a popular and substantial incentive, such as an iPad. An estimated 48% of young Americans report finding out about up-to-date news through Facebook (Bullas, 2014). As such, Facebook has become a leading platform for sharing third party materials, by permitting external websites to integrate with user content through its Facebook Platform. This is made possible by a function called *Open Graph*, which enables external webpages to merge with Facebook by allowing individual users to click on small blue buttons, often situated near the top of the webpages. These designated “*like*”, “*share*”, and “*recommend*” buttons enable Facebook users to endorse their online digestions on their newsfeed to their Facebook friends, thus disseminating online content through their immediate and extended networks. This information systems technology supports Facebook users in further

connecting with their friend networks by permitting web content to easily weave across the Internet. Within the first year that Facebook platform integrated Open Graph, over 100 million users took advantage of this new option by sharing external webpages they had visited with their Facebook friends (Overland, 2010). Just in 2010, over 250 million people engaged with Facebook monthly through Open Graph. This technology has since helped Facebook advance into the leading hub of information sharing activity (Rise, 2010).

As of this writing, SurveyMonkey does not participate in the *Open Graph* platform. If SurveyMonkey offered the option of allowing survey takers to “like” or “share” the surveys they are taking, other individuals in the test taker’s Facebook networks may be more inclined or willing to click on the Facebook ad themselves and participate in the survey at hand. Given that *SurveyMonkey* is the world's leading provider for web-based surveying, the ramifications may be valuable for recruiting if it integrated with Facebook’s information sharing platform.

Twitter Campaign

Twitter was the least effective recruitment mechanism examined in this study. This method reached 2.45% of the target population, at \$22.20 per recruited participant. Twitter allows users to send brief messages across its platform and has the option of re-tweeting, or essentially, forwarding a message, to the users’ own network of followers. In both prior studies using Twitter for online recruitment (O’Connor, 2013; Quach et al., 2013), researchers were responsible for tweeting the contents of the study, while monitoring conversations and targeting participants for recruitment. Even as such, these

studies' mixed results indicate a need for refinement of this method's implementation strategy.

A different strategy with Twitter was used in this study in an attempt to be minimally intrusive to the high schools and personalizing the target student body's experience. A core group of students were selected from the target population in order to tweet out the campaign message. Communication with the core group upon meeting was mostly unidirectional and focused entirely on the study recruitment, which may not have been particularly appealing for this young audience. The Twitter campaign relied on a school counselor to gather the core group members. Although all core group members belonged to school clubs or athletic teams, little is known regarding the degree of influence or popularity these students possessed on Twitter. Research has found that indegree, which represents the number of people who follow a particular user on Twitter, does not necessarily equate to a similarly high degree of influence, such as engaging other Twitter users to re-tweet the initial message to their own network of followers (Cha et al., 2010). This present study's arbitrary selection of the core group may have contributed to the disappointing recruitment percentage. Cha also theorized that re-tweeting of messages on Twitter are actually driven more so by the content value of a tweet, versus the name value of the tweeter. In other words, the Twitter message used in this study may not have been regarded as sufficiently valuable or appealing by the target adolescent population to be retweeted thereafter, regardless of who tweeted the initial message.

From a perspective of basic motivation, participants may have experienced incongruent motives in tweeting the contest message to their network of followers,

because an increase in contest participation would be associated with a decrease in winning probability of the iPad incentive. Core group members were given an auxiliary level of incentives, which were iTunes gift cards, for participating in the initial tweeting. However, it was counterproductive for other participants to actively re-tweet the contest message to other users, as that would actually be a disincentive to their chances of winning the iPad. If a more rewarding strategy of recruitment were used, Twitter could potentially be more successful in reaching a wider network of the target population and be a cost-effective recruitment channel by using a type of snowball sampling. In the present study, the cost of Twitter was lower than Facebook, but Twitter recruited fewer participants.

Cost Effectiveness

QR code postcards were the most cost-efficient means of recruiting rural adolescents within a three-week period. Final cost to recruit using QR code postcards was \$6.57 per recruited sample, which is less expensive than prior health research recruitment via social media channels (Lohse, 2013; Lohse & Wamboldt, 2013; Ramo, Hall, & Prochaska, 2010). Cost per sample incurred by Facebook (\$30.29) and Twitter (\$22.20) to recruit respective high school adolescents from distinct schools were not as encouraging as QR code postcards. Costs associated with prior studies using Facebook as the channel to recruit low-income individual ranged from \$15.30 to \$32.26 per recruited sample. Recent research conducted by Chu and Snider (2013) found positive effects in capitalizing on Facebook's reach by adjusting advertising patterns to their target population. Baseline user information related to user patterns would further identify successful recruitment strategies in the future.

All three channels of adolescent recruitment in this study were less expensive than average costs of \$51.59 incurred per participant using traditional recruitment channels of flyers and telephone calls (Lohse et al, 2012). However, it is important to note that these findings may be delimited by this study's lack of information on costs incurred other than monetary, such as human labor costs. There was no system put in place for personnel involved in the recruitment process to systematically log hours. Future studies must take this into consideration and factor in these missing pieces of information, as it is difficult to conclusively determine the bottom line cost of each method without such data. Lastly, it is important to note that recruitment burden exerted upon the school communities varied across the recruitment channels.

Another dimension of interest was the rate of responses across channels during the three week time interval. Across the contest period of 22 days, all three channels in each respective campaign had the highest percentage of recruited participants on the first day. First day responses were: Twitter 92.59% (n=25), QR codes 68.04% (n=66), and Facebook 9.68% (n=3), of each respective total sample. As for how many total days each recruitment had participants respond: Twitter had 3 active days, QR codes had 16 active days, and Facebook ads had 19 active days. These participation trends could offer helpful information regarding how online recruitment channels differ in their respective penetration patterns. For example, given the comparatively low first day response percentage and greater number of total active days, it can be concluded that Facebook recruitment is a more gradual method of research recruitment.

Regardless of the recruitment channel used, it is essential for researchers to be confident in the quality and fidelity of participant responses. Subject responses should be notwithstanding of the way in which they were recruited. One pertinent study examined the data quality of responses recruited via social media postings (Facebook, Twitter, Reddit), Amazon's Mechanical Turk (MTurk), and face-to-face behavioral testing (Casler, Bickel, & Hackett, 2013). The authors concluded that the three recruitment samples provided responses that were nearly identical, and traditionally in-person tasks may be conducted through alternative means with ample quality assurance. Results of Casler et al.'s (2013) study are encouraging for investigating the usefulness and value of nontraditional recruitment channels.

Limitations

As a context, this study was conducted in three different school settings where experimental manipulation and control were limited. When considering these findings, it is important to keep in mind that it was an exploratory study and there are five limitations that should be mentioned.

First, different implementation strategies were used at each recruitment site. For example, Facebook ads were not prompted or advertised in the schools, nor was a core group selected, whereas QR codes relied on a school representative to distribute postcards throughout the school. For QR codes, it was the only recruitment channel that utilized a school counselor as the study's liaison. The rationale for the school liaison was the use of QR codes required a liaison for integrating the postcards to classrooms and answering questions regarding accessing the online survey through QR code postcards. Use of the school counselor may be related to an increase in response rate, although it is

not possible to disentangle it from QR codes because it is part of the QR code methodology. In addition, the Twitter campaign utilized 10 students in the school, whereas the Facebook condition did not have anyone in the school directly involved with accessing the online survey. Nevertheless, this variance in school involvement makes it difficult to identify the distinct factors that contribute to a recruitment channel's effectiveness. This study wanted to best capture the natural ways in which each social media channel is primarily used. Regardless, variance in implementation strategy is a shortcoming of this study and confounds the ability to contribute outcomes exclusively to the recruitment channel.

Second, this study was conducted in three high schools that implemented different social norms campaigns. These campaigns were previously implemented within the high schools and were community-wide health interventions. Although the three schools were randomly assigned a recruitment channel, each school's social norms campaign may have been at different phases of intervention. This is a further limitation to this study, as outcomes may have been affected by varying student awareness of their respective social norms campaigns.

Third, there may be an issue related to accessibility of technologies. Although the Internet has become pervasive in current society, with 87% of all Americans having access to the Internet (Internet Users, 2014), it is still disproportionately not available to disadvantaged populations. Differing Internet usage in socioeconomically or educationally disadvantaged groups of individuals, who may lack the skills to use, or have inadequate access to Internet technologies, are essential to consider. Mobile technology is on the rise, but not all adolescents have access to smartdevices. Although

Facebook and Twitter are accessible through means other than smartphones and tablets, QR code reading software is not. Furthermore, QR code reading software is not equipped with every smartphone. Users must scan the code with a smartdevice. Researchers must cope with this burden of usability, as QR code is still a transitional technology. Without a way to scan the code, users are left with a meaningless barcode. In this way, accessibility stands as a main limitation in using QR codes as a vehicle for online research recruitment.

Fourth, social media recruitment channels have the potential to contaminate study outcomes by participation of individuals outside the inclusion criteria. As with any online component of research, participant responses must be inspected carefully for eligibility. Providing popular incentives to recruit adolescents resulted in repeated attempts to access and complete the online surveys. All participants were required to provide their names and contact information upon completion of the surveys in order to cross-reference their school attendances, which may have deterred some ineligible participants due to the fact that they are in fact not on the school enrollment rosters. This study also manually checked for duplicate survey attempts and only included the initial surveys. However, this fidelity strategy can be tedious or problematic if sample sizes were much larger or enrollment rosters were inaccessible.

Fifth, recruitment outcomes may be different for online research recruitment in populations other than high school adolescents ages 14-18 living in rural communities, thus the generalizability is limited, which was exacerbated by somewhat low participation rates in the target school populations.

Future Research

Despite the mentioned limitations, the study sample was demographically similar to the target population and a relatively ample sample size was obtained by one of the channels, QR codes, during the recruitment period. Although implications should be reviewed prudently, valuable information was gathered and the results identified areas ripe for follow-up studies.

There are four primary directions in which future studies might follow. First, it would be of interest to be able to examine separately, the social media method and school involvement. In other words, one might design a study to examine social media channels implemented with and without a school liaison. Second, it would be useful to examine in detail, what factors of each social media method are related to optimal responding. In other words, what should be in the content of the Facebook advertisements, who should tweet messages and how often should it occur, and what is the best way to disseminate QR codes. Third, it would be useful to have base rate data on what social media high school students use and how often. This information could be useful in perhaps profiling students to be better able to recruit them by knowing how many are using each type of social media. Fourth, it would be of interest to know if combinations of social media campaigns would be more cost effective. In other words, perhaps recruiting students with Facebook advertisements and QR codes may be more successful than each used independently. Perhaps if students received the same message from multiple social media channels, they would be more likely to respond. Overall, there are many avenues of research to pursue in this area, which would provide theoretical and practical answers to questions concerning the recruiting of adolescents using social media.

Conclusion

This study's focus was the reach potential of three social media recruitment channels in rural adolescent populations. Results from this study reveal a significantly higher response rate in recruiting adolescent students using QR code postcards, when compared to Facebook and Twitter. Costs related to the recruitment channels were relatively inexpensive and minimal personnel efforts were required. The potential for social media based recruitment channels for saving both time and money can be substantial. In the advent of increasingly affordable and accessible mobile phone technologies, the future of health research will undeniably be related to an understanding in using these technologies for subject recruitment. This is the only known study that has examined the effectiveness of QR code postcards in targeting rural adolescent populations for online health research.

All three recruitment channels in this study offer the advantage of speedy online recruitment and data collection, in both gathering responses and gathering data. The advancement of mobile technologies, such as smartphones and tablets, has altered the way adolescents access the Internet on the go. Thus, online health research does not have to rely solely on computers as the only vehicle to connect participants with research. Young people's increasing accessibility to the Internet means increased ability to access survey contents, and the potential to broaden the reach to this population.

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